

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-112417

(43)Date of publication of application : 28.04.1998

(51)Int.Cl.

H01G 4/12  
H01G 4/12  
H01G 4/30  
H05K 3/46

(21)Application number : 08-265996

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(22)Date of filing : 07.10.1996

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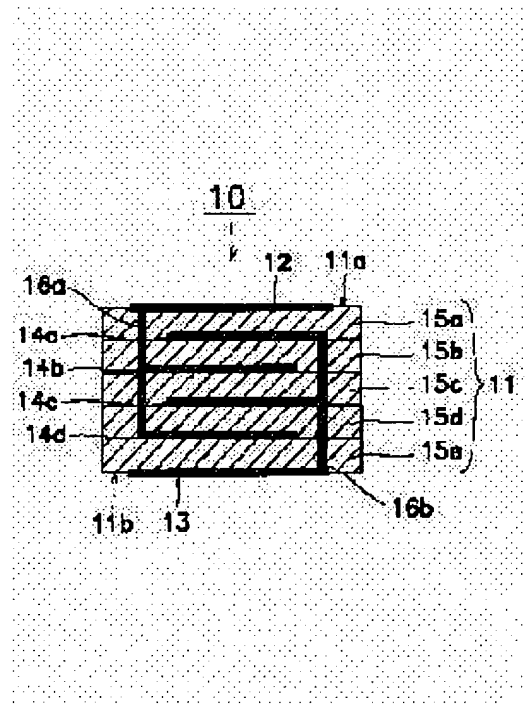
## (54) LAMINATED ELECTRONIC COMPONENT AND ITS MANUFACTURE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To prevent separation of a back-side electrode from a layered product and make possible realization of a higher density.

**SOLUTION:** A laminated ceramic capacitor 10 includes a layered product 11, and an surface-side electrode 12 and a back-side electrode 13 as external electrodes. In the layered product 11, a plurality of ceramic raw sheets 15a to 15e are stacked in a state that internal electrodes 14a to 14d to be circuit elements are provided between the ceramic raw sheets. The surface-side electrode 12 is provided on a surface 11a as another main surface of the layered product 11, and the back-side electrode 13 is provided on a surface 11b as one main surface of the layered product 11. In the ceramic raw sheets 15a to 15e, connection means penetrating these sheets in the direction of thickness, for example, via holes 16a, 16b, are formed.

The via holes 16a, 16b are used for connecting the surface-side electrode 12 with the internal electrodes 14b, 14d, and for connecting the back-side electrode 13 with the internal electrodes 14a, 14c, respectively.



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## 【特許請求の範囲】

【請求項1】 回路要素となるべき内部電極を介在させた状態で複数のセラミック生シートが積層されてなり、相対する主面と該主面間を連結する側面とを有する積層体と、前記積層体の一方主面である裏面に設けられた裏面電極とを備え、

前記裏面電極を、前記積層体の裏面に食い込ませたことを特徴とする積層セラミック電子部品。

【請求項2】 複数のセラミック生シート及びキャリアフィルムを準備し、かつ前記複数のセラミック生シートのうち少なくとも1つのものの一方主面上に内部電極となるべき金属ペースト膜を、前記キャリアフィルムの一方主面上に裏面電極となるべき金属ペースト膜を形成した後、前記キャリアフィルムの一方主面側に前記複数のセラミック生シートを積み重ね、これらを圧着し、その後前記キャリアフィルムを取り除いたことを特徴とする請求項1に記載の積層セラミック電子部品の製造方法。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、積層セラミック電子部品及びその製造方法に関し、特に、回路要素となるべき内部電極を内部に配置し、外部電極を両主面に配置した積層セラミック電子部品及びその製造方法に関する。

## 【0002】

【従来の技術】積層セラミック電子部品には、積層セラミックコンデンサ、積層セラミックインダクタ、積層セラミック抵抗体、あるいはこれらの素子の複数を一体とした積層セラミック複合部品等がある。そのような電子部品の代表例として、図3に積層セラミックコンデンサ1の断面図を示す。積層セラミックコンデンサ1は、積層体2の内部に内部電極3a～3dを、積層体2の表面2aに外部電極としての表面電極4を、積層体2の裏面2bに外部電極としての裏面電極5を備える。この際、内部電極3b、3dと表面電極4とがビアホール6aで、内部電極3a、3cと裏面電極5とがビアホール6bで接続される。

【0003】図4に積層セラミックコンデンサ1を形成するための製造工程図を示す。まず、(a)の工程として、誘電体磁器粉末と有機バインダとを混合してスラリーを形成し、ドクターブレード法やリバースコート法等のスリットキャスト方法によって、厚さ数十μmのセラミック生シート7a～7eを得る。そして、

(b)の工程として、このセラミック生シート7a～7eには、シートの厚み方向の電気的導通を可能とするため、セラミック生シート7a～7eを貫通するビアホール6a、6bがパンチング等により形成される。

【0004】次いで、(c)の工程として、セラミック生シート7a～7eの表面には、パラジウム等の導電ペーストを用いて、スクリーン印刷法やロール転写法によ

って、回路要素(図示せず)となるべき内部電極3a～3dあるいは外部電極としての表面電極4が印刷される。そして、(d)の工程として、セラミック生シート7a～7eが積み重ねられる。

【0005】次いで、(e)の工程として、圧着機(図示せず)の2枚の平行な平板間に置かれ、これらの平板を上下から移動させて圧着することにより積層体2を得る。その後、積層体2を構成するセラミック生シート7a～7eを焼結させるため、積層体2は焼成される。この際、内部電極3a～3d及び表面電極4は、セラミック生シート7a～7eと同時に焼成される。そして、(f)の工程として、積層体2の裏面2bに、パラジウム等の導電ペーストを用いて、スクリーン印刷法やロール転写法によって、導体塗膜を形成し、焼き付け処理して外部電極としての裏面電極5を形成する。この際、表面電極4及び裏面電極5は、ビアホール6a、6bにより内部電極3a～3dと接続される。

【0006】なお、(e)の工程と(f)の工程が逆になり、積層体2を圧着することにより得た後、積層体2の裏面に裏面電極5を形成し、その後、積層体2を構成するセラミック生シート7a～7eの焼結と裏面電極5の焼き付け処理を兼ねて焼成する場合もある。

## 【0007】

【発明が解決しようとする課題】しかしながら、上述した積層セラミック電子部品においては、セラミック生シートの両面に内部電極と裏面電極とを同時に印刷できないため、表面電極あるいは内部電極が印刷された複数のセラミック生シートを圧着及び焼成することにより形成される積層体を作製した後、その積層体の裏面に、裏面電極を印刷及び焼き付けにより設けなければならない。したがって、裏面電極を設ける工程が積層体の圧着工程より後になり、その結果、裏面電極を積層体の裏面に食い込ませることができない。

【0008】よって、メッキ等の酸処理時にメッキ液が積層体の裏面と裏面電極との間に侵入する恐れがあり、メッキ液の侵入により、裏面電極が積層体から剥離しやすいという問題がある。また、裏面電極のエッジに力が加わると、裏面電極が積層体から剥離しやすいという問題がある。

【0009】さらに、積層体を焼成した後、積層体の裏面に裏面電極を形成する場合には、焼成時の収縮により積層体が±0.6%程度の寸法ばらつきを有するため、裏面電極の位置とビアホールの位置にズレが生じる。したがって、裏面電極の面積を大きくする必要が生じ、高密度化の妨げになるという問題がある。また、焼成後に積層体の裏面にビアホールの凹凸が生じるため、印刷により形成される裏面電極ににじみが生じ、高密度化の妨げになるという問題がある。さらに、積層体を焼成する工程と裏面電極を焼き付ける工程との2度の焼成工程が必要になることがあり、この場合、コストアップになる

という問題がある。

【0010】また、積層体を圧着した後、すなわち焼成する前に、積層体の裏面に裏面電極を形成し、積層体を焼成する工程と裏面電極を焼き付ける工程を同時に行う場合には、圧着により積層体が0.1～0.8%程度伸びるため、裏面電極の位置とビアホール16aの位置にズレが生じる。したがって、裏面電極の面積を大きくする必要が生じ、高密度化の妨げになるという問題がある。

【0011】本発明は、このような問題点を解決するためになされたものであり、裏面電極が積層体から剥離せず、高密度化が可能な積層セラミック電子部品及びその製造方法を提供することを目的とする。

【0012】

【課題を解決するための手段】上述の問題点を解決するため、本発明の積層セラミック電子部品は、回路要素となるべき内部電極を介在させた状態で複数のセラミック生シートが積層されてなり、相対する主面と該主面間を連結する側面とを有する積層体と、前記積層体の一方主面である裏面に設けられた裏面電極とを備え、前記裏面電極を、前記積層体の裏面に食い込ませたことを特徴とする。

【0013】また、本発明の積層セラミック電子部品の製造方法は、複数のセラミック生シート及びキャリアフィルムを準備し、かつ前記複数のセラミック生シートのうち少なくとも1つのものの一方主面上に内部電極となるべき金属ペースト膜を、前記キャリアフィルム的一方主面上に裏面電極となるべき金属ペースト膜を形成した後、前記キャリアフィルム的一方主面側に前記複数のセラミック生シートを積み重ね、これらを圧着、その後前記キャリアフィルムを取り除いたことを特徴とする。

【0014】本発明の積層セラミック電子部品によれば、裏面電極を積層体の裏面に食い込ませているため、メッキ等の酸処理時にメッキ液が積層体の裏面と裏面電極との間に侵入することを防ぐことができる。

【0015】また、本発明の積層セラミック電子部品の製造方法によれば、セラミック生シート、内部電極及び裏面電極を、同時に、圧着及び焼成するため、裏面電極の位置とビアホール16aの位置とを設計通りに一致させることができる。

【0016】

【発明の実施の形態】以下、図面を参照して本発明の実施例を説明する。図1に、本発明の積層セラミック電子部品に係る一実施例の断面図を示す。10は、積層セラミック電子部品の代表例である積層セラミックコンデンサである。

【0017】積層セラミックコンデンサ10は、積層体11と、外部電極である表面電極12及び裏面電極13とで構成されている。積層体11は、回路要素となるべき内部電極14a～14dを内部に介在させた状態で複数のセラミック生シート15a～15eが積層される。

【0018】ここで、表面電極12は積層体11の他方主面である表面11aに、裏面電極13は積層体11の一方主面である裏面11bに設けられ、それぞれ積層体11の表面11a、あるいは裏面11bに一部が食い込んでいるものである。

【0019】そして、セラミック生シート15a～15eには、その厚み方向を貫く接続手段、例えばビアホール16a、16bが形成され、このビアホール16a、16bは、表面電極12と内部電極14b、14dを、あるいは裏面電極13と内部電極14a、14cを接続するために用いられる。

【0020】次に、図2に基づいて、積層セラミックコンデンサ10を得るための製造方法を説明する。まず、(a)の工程として、誘電体磁器粉末と有機バインダとを混合してスラリーを形成し、ドクターブレード法やリバースコート法等のスリットキャスト方法によって、厚さ十数μmのセラミック生シート15a～15eを得る。そして、(b)の工程として、セラミック生シート15a～15eには、シートの厚み方向の電気的導通を可能とするため、セラミック生シート15a～15eを貫通するビアホール16a、16bがパンチング等により形成される。

【0021】次いで、(c)の工程として、パラジウム等の導電ペーストを用いて、スクリーン印刷法やロール転写法によって、表面電極12あるいは回路要素(図示せず)となるべき内部電極14a～14dが、セラミック生シート15a～15eの一方主面に印刷される。そして、(d)の工程として、パラジウム等の導電ペーストを用いて、スクリーン印刷法やロール転写法によって、裏面電極13が一方主面に印刷されているキャリアフィルム、例えばプラスチックフィルム17の一方主面側(裏面電極13が形成されている側)に、内部電極14a～14dが一方主面に印刷されているセラミック生シート15a～15eが積み重ねられる。

【0022】次いで、(e)の工程として、圧着機(図示せず)の2枚の平行な平板間に置かれ、これらの平板を上下から移動させて圧着することにより積層体11を得る。そして、(f)の工程として、積層体11からプラスチックフィルム17が剥がされた後、他方主面である表面に表面電極12が、一方主面である裏面に裏面電極13が、内部に内部電極14a～14dが形成された積層体11を構成するセラミック生シート15a～15eを焼結させるため、焼成される。この際、表面電極12、裏面電極13及び内部電極14a～14dは、セラミック生シート15a～15eと同時に焼成され、表面電極12及び裏面電極13は、ビアホール16a、16bにより内部電極14a～14dと接続される。また、表面電極12及び裏面電極13は、圧着工程により積層体11の表面11a及び裏面11bに一部が食い込んでいる。以上の製造工程を経て、積層セラミックコンデン

サ10が製造される。

【0023】上述したように、本実施例の積層セラミックコンデンサによれば、裏面電極を積層体の裏面に食い込ませているため、メッキ等の酸処理時にメッキ液が積層体の裏面と裏面電極との間に侵入することを防ぐことができるため、裏面電極が積層体から剥離することを防ぐことができる。また、裏面電極のエッジに力が加わった場合にも、裏面電極が積層体の裏面に食い込んでいるため、裏面電極が積層体から剥離することを防ぐことができる。

【0024】さらに、抵抗を小さくするために、裏面電極の厚みを厚くしても、圧着工程により、積層体の裏面に裏面電極を形成するため、裏面電極の平滑性が悪化しない。したがって、高周波使用時に、裏面電極の抵抗を下げることができ、積層セラミックコンデンサの特性を向上させることができる。

【0025】また、焼成後に積層体の裏面にビアホール凹凸ができなため、積層体の裏面が平滑になり、裏面電極のにじみがなくなる。したがって、裏面電極の高密度化が可能となるため、積層セラミック電子部品の小型化が可能となる。

【0026】さらに、本実施例の積層セラミックコンデンサの製造方法によれば、裏面電極が設けられたプラスチックフィルム上に表面電極あるいは内部電極が設けられたセラミック生シートが積み重ねて得られる積層体を圧着し、積層体からプラスチックフィルムを剥がした後、焼成するため、裏面電極を積層体の裏面に食い込ませることができると同時に、裏面電極の位置とビアホールの位置とを設計通りに一致させることができる。したがって、裏面電極の高密度化が可能となり、積層セラミックコンデンサの小型化が可能となる。

【0027】また、裏面電極が圧着時につぶれるため、裏面電極がち密になり、裏面電極の抵抗を下げるができる。

【0028】さらに、積層体を焼成する工程と裏面電極を焼き付ける工程とを同時に行うため、1度の焼成工程で製造が可能となる。したがって、製造コストの低減及び製造工程の短縮ができる。

【0029】なお、本実施例では、積層セラミックコンデンサを個々に製造する場合について説明したが、マザーセラミック生シートを積み重ねて、マザー積層体を形成し、そのマザー積層体を切断することにより、積層セラミックコンデンサを製造してもよい。この場合には、1度の工程で複数の積層セラミックコンデンサを製造することができるため、製造コストをさらに低減することができる。

【0030】また、表面電極と内部電極、裏面電極と内部電極の接続手段がビアホールの場合について説明したが、スルーホール、端面電極及びそれらの組み合わせでもよい。

【0031】さらに、積層体からプラスチックフィルムが剥がされた後、積層体を焼成する場合について説明したが、積層体を焼成する際に、プラスチックフィルムを焼成により取り除いてもよい。

【0032】また、裏面電極の一部が、積層体の裏面に食い込んでいる場合について説明したが、裏面電極の全てが、積層体の裏面に食い込んでもよい。

【0033】さらに、積層セラミックコンデンサの場合を例に挙げて説明したが、積層セラミックインダクタ、積層セラミック抵抗体、あるいはそれらの素子の複数を一体とした積層セラミック複合部品等の他の積層セラミック電子部品にも適用できることはいうまでもない。

【0034】

【発明の効果】請求項1の積層セラミック電子部品によれば、裏面電極を積層体の裏面に食い込ませているため、メッキ等の酸処理時にメッキ液が積層体の裏面と裏面電極との間に侵入することを防ぐことができるため、裏面電極が積層体から剥離することを防ぐことができる。また、裏面電極のエッジに力が加わった場合にも、裏面電極が積層体から剥離することを防ぐことができる。

【0035】さらに、抵抗を小さくするために、裏面電極の厚みを厚くしても、圧着工程により、積層体の裏面に裏面電極を形成するため、裏面電極の平滑性が悪化しない。したがって、高周波使用時に、裏面電極の抵抗を下げることができ、積層セラミックコンデンサの特性を向上させることができる。

【0036】また、焼成後に積層体の裏面にビアホール凹凸ができなため、積層体の裏面が平滑になり、裏面電極のにじみがなくなる。したがって、裏面電極の高密度化が可能となるため、積層セラミック電子部品の小型化が可能となる。

【0037】請求項2の積層セラミック電子部品の製造方法によれば、裏面電極が設けられたプラスチックフィルム上に表面電極あるいは内部電極が設けられたセラミック生シートが積み重ねて得られる積層体を圧着し、積層体からプラスチックフィルムを剥がした後、焼成するため、裏面電極を積層体の裏面に食い込ませることができると同時に、裏面電極の位置とビアホールの位置とを設計通りに一致させることができる。したがって、裏面電極の高密度化が可能となり、積層セラミック電子部品の小型化が可能となる。

【0038】また、裏面電極が圧着時につぶれるため、裏面電極がち密になり、裏面電極の抵抗を下げるができる。

【0039】さらに、積層体を焼成する工程と裏面電極を焼き付ける工程とを同時に行うため、1度の焼成工程で製造が可能となる。したがって、製造コストの低減及び製造工程の短縮ができる。

50 【図面の簡単な説明】

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【図1】本発明の積層セラミック電子部品に係る一実施例の断面図である。

【図2】図1に示した積層セラミック電子部品を得るための製造工程図である。

【図3】従来の積層セラミック電子部品を示す断面図である。

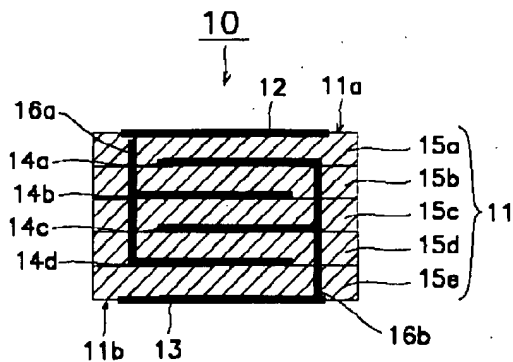
【図4】図3に示した積層セラミック電子部品を得るための製造工程図である。

【符号の説明】

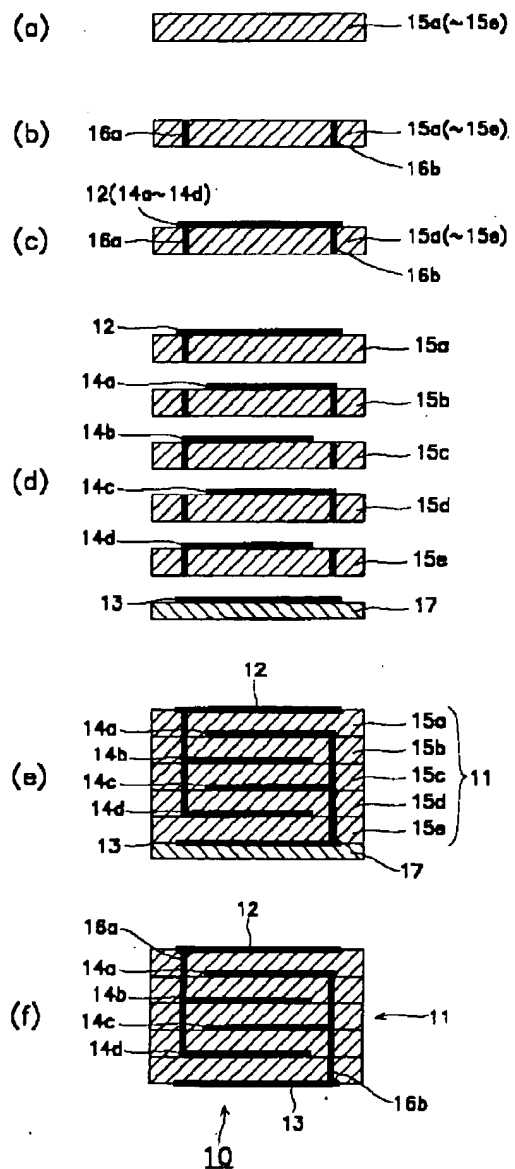
8

- 10 積層セラミック電子部品
- 11 積層体
- 11a 他方主面（表面）
- 11b 一方主面（裏面）
- 13 裏面電極
- 14a～14d 内部電極
- 15a～15e セラミック生シート
- 17 キャリアフィルム（プラスチックフィルム）

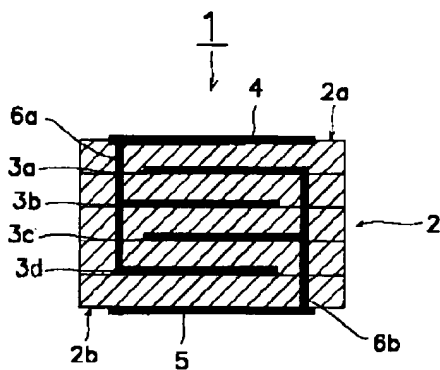
【図1】



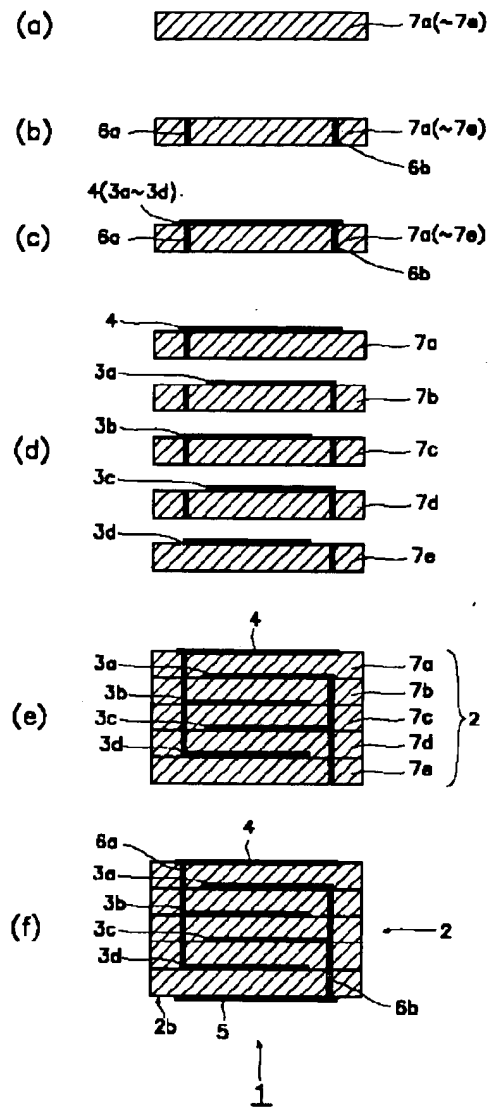
【図2】



【図3】



【図4】



**\* NOTICES \***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the laminating ceramic electronic parts which have arranged the internal electrode which should serve as a circuit element inside about laminating ceramic electronic parts and its manufacture approach, and have arranged the external electrode to both principal planes, and its manufacture approach.

[0002]

[Description of the Prior Art] There is a stacked type ceramic condenser, a laminating ceramic inductor, a laminating ceramic resistor, or laminating ceramic composite part that made the plurality of these components one in laminating ceramic electronic parts. As an example of representation of such electronic parts, the sectional view of a stacked type ceramic condenser 1 is shown in drawing 3. a stacked type ceramic condenser 1 -- inside a layered product 2, surface 2a of a layered product 2 is equipped with the surface electrode 4 as an external electrode, and rear-face 2b of a layered product 2 is equipped with the rear-face electrode 5 as an external electrode for internal electrodes 3a-3d. Under the present circumstances, internal electrodes 3b and 3d and a surface electrode 4 are connected by beer hall 6a, and internal electrodes 3a and 3c and the rear-face electrode 5 are connected by beer hall 6b.

[0003] The production process Fig. for forming a stacked type ceramic condenser 1 in drawing 4 is shown. First, as a process of (a), dielectric porcelain powder and an organic binder are mixed, a slurry is formed, and the ceramic student sheets 7a-7e with a thickness of about ten micrometers are obtained by the slit casting approaches, such as a doctor blade method and the reverse coat method. And as a process of (b), in order to enable an electric flow of the thickness direction of a sheet, the beer halls 6a and 6b which penetrate the ceramic student sheets 7a-7e are formed in these ceramic student sheets 7a-7e of punching etc.

[0004] Subsequently, the surface electrode 4 as the internal electrodes 3a-3d which should serve as a circuit element (not shown) with screen printing or a roll replica method, or an external electrode is printed by the front face of the ceramic student sheets 7a-7e, using conductive paste, such as palladium, as a process of (c). And the ceramic student sheets 7a-7e are accumulated as a process of (d).

[0005] Subsequently, a layered product 2 is obtained by being placed between the parallel plates of two sheets of a sticking-by-pressure machine (not shown), moving these plates from the upper and lower sides, and being stuck by pressure as a process of (e). Then, in order to make the ceramic student sheets 7a-7e which constitute a layered product 2 sinter, a layered product 2 is calcinated. Under the present circumstances, internal electrodes 3a-3d and a surface electrode 4 are calcinated by the ceramic student sheets 7a-7e and coincidence. and -- as the process of (f) -- rear-face 2b of a layered product 2 -- conductive paste, such as palladium, -- using -- screen printing and a roll replica method -- a conductor -- it forms, and it can be burned, a paint film is processed, and the rear-face electrode 5 as an external electrode is formed. Under the present circumstances, a surface electrode 4 and the rear-face electrode 5 are connected with internal electrodes 3a-3d by beer halls 6a and 6b.

[0006] In addition, the process of (e) and the process of (f) may become reverse, after obtaining by sticking a layered product 2 by pressure, the rear-face electrode 5 may be formed in the rear face of a layered product 2, and it may calcinate after that to serve also as sintering of the ceramic student sheets 7a-7e and the baking processing of the rear-face electrode 5 which constitute a layered product 2.

[0007]

[Problem(s) to be Solved by the Invention] However, in the laminating ceramic electronic parts mentioned above, since an internal electrode and a rear-face electrode cannot be printed to both sides of a ceramic student sheet at coincidence, after producing the layered product formed by sticking by pressure and calcinating two or more ceramic student sheets with which the surface electrode or the internal electrode was printed, a rear-face electrode must be prepared in the rear face of the layered product by printing and baking. Therefore, the process which prepares a rear-face electrode can come after the sticking-by-pressure process of a layered product, consequently a rear-face electrode cannot be made to



eat into the rear face of a layered product.

[0008] Therefore, there is a possibility that plating liquid may invade between the rear face of a layered product and a rear-face electrode, at the time of acid treatment, such as plating, and there is a problem that a rear-face electrode tends to exfoliate from a layered product, by invasion of plating liquid. Moreover, when the force joins the edge of a rear-face electrode, there is a problem that a rear-face electrode tends to exfoliate from a layered product.

[0009] Furthermore, since a layered product has dimension dispersion which is about  $\pm 0.6\%$  by contraction at the time of baking in forming a rear-face electrode in the rear face of a layered product after calcinating a layered product, gap arises in the location of a rear-face electrode, and the location of a beer hall. Therefore, it will be necessary to enlarge area of a rear-face electrode, and there is a problem of becoming the hindrance of densification. Moreover, since the irregularity of a beer hall arises at the rear face of a layered product after baking, a blot arises in the rear-face electrode formed of printing, and there is a problem of becoming the hindrance of densification. Furthermore, the baking process of 2 times of the process which calcinates a layered product, and the process which can be burned in a rear-face electrode may be needed, and there is a problem of becoming a cost rise in this case.

[0010] Moreover, after sticking a layered product by pressure, namely, before calcinating, a rear-face electrode is formed in the rear face of a layered product, and since it extends a layered product about 0.1 to 0.8% by sticking by pressure in performing to coincidence the process which calcinates a layered product, and the process which can be burned in a rear-face electrode, gap arises in the location of a rear-face electrode, and the location of a beer hall. Therefore, it will be necessary to enlarge area of a rear-face electrode, and there is a problem of becoming the hindrance of densification.

[0011] It is made in order to solve such a trouble, and a rear-face electrode does not exfoliate from a layered product, but this invention aims at offering the laminating ceramic electronic parts in which densification is possible, and its manufacture approach.

[0012]

[Means for Solving the Problem] It has the layered product which has the side face which connects between the principal plane which it comes to carry out the laminating of two or more ceramic student sheets in the condition that the laminating ceramic electronic parts of this invention made the internal electrode which should serve as a circuit element intervene in order to solve an above-mentioned trouble, and faces, and this principal plane, and the rear-face electrode prepared in the rear face of said layered product which is a principal plane on the other hand, and is characterized by to make said rear-face electrode eat into the rear face of said layered product.

[0013] Moreover, the manufacture approach of the laminating ceramic electronic parts of this invention Two or more ceramic student sheets and carrier films are prepared. Among said two or more ceramic student sheets the metal paste film of at least one thing which should serve as an internal electrode on a principal plane on the other hand On the other hand, after forming the metal paste film of said carrier film which should serve as a rear-face electrode on a principal plane, on the other hand, said two or more ceramic student sheets are accumulated on a principal plane side, and it is characterized by the thing of said carrier film sticking by pressure and its account carrier film of back to front were removed [ the thing ] for these.

[0014] According to the laminating ceramic electronic parts of this invention, since the rear-face electrode is made to eat into the rear face of a layered product, it can prevent plating liquid invading between the rear face of a layered product, and a rear-face electrode at the time of acid treatment, such as plating.

[0015] Moreover, since a ceramic student sheet, an internal electrode, and a rear-face electrode are stuck by pressure and calcinated to coincidence, the location of a rear-face electrode and the location of a beer hall can be made in agreement as a design according to the manufacture approach of the laminating ceramic electronic parts of this invention.

[0016]

[Embodiment of the Invention] Hereafter, the example of this invention is explained with reference to a drawing. The sectional view of one example which starts the laminating ceramic electronic parts of this invention at drawing 1 is shown. 10 is a stacked type ceramic condenser which is the example of representation of laminating ceramic electronic parts.

[0017] The stacked type ceramic condenser 10 consists of a layered product 11, and the surface electrode 12 and the rear-face electrode 13 which is an external electrode. The laminating of two or more ceramic student sheets 15a-15e in the condition that the layered product 11 made the internal electrodes 14a-14d which should serve as a circuit element placed between the interior is carried out.

[0018] Here, the rear-face electrode 13 was formed in rear-face 11b of a layered product 11 which is a principal plane on the other hand, and the part is eating into surface 11a whose surface electrode 12 is the another side principal plane of a layered product 11 at surface 11a or rear-face 11b of a layered product 11, respectively.

[0019] And the connecting means 16a and 16b which pierces through that thickness direction, for example, beer halls, is formed, and these beer halls 16a and 16b are used for the ceramic student sheets 15a-15e in order to connect a

surface electrode 12, internal electrodes 14b and 14d, or the rear-face electrode 13 and internal electrodes 14a and 14c. [0020] Next, based on drawing 2, the manufacture approach for obtaining a stacked type ceramic condenser 10 is explained. First, as a process of (a), dielectric porcelain powder and an organic binder are mixed, a slurry is formed, and the ceramic student sheets 15a-15e with a thickness of about ten micrometers are obtained by the slit casting approaches, such as a doctor blade method and the reverse coat method. And as a process of (b), in order to enable an electric flow of the thickness direction of a sheet, the beer halls 16a and 16b which penetrate the ceramic student sheets 15a-15e are formed in the ceramic student sheets 15a-15e of punching etc.

[0021] subsequently, the internal electrodes 14a-14d which should serve as a surface electrode 12 or a circuit element (not shown) with screen printing or a roll replica method, using conductive paste, such as palladium, as a process of (c) -- the ceramic student sheets 15a-15e -- on the other hand, it is printed by the principal plane. And the ceramic student sheets 15a-15e of the carrier film 17 with which the rear-face electrode 13 is printed by the principal plane on the other hand with screen printing or a roll replica method, for example, plastic film, with which internal electrodes 14a-14d are printed by the principal plane on the other hand at the principal plane side (side in which the rear-face electrode 13 is formed) are accumulated, using conductive paste, such as palladium, as a process of (d).

[0022] Subsequently, a layered product 11 is obtained by being placed between the parallel plates of two sheets of a sticking-by-pressure machine (not shown), moving these plates from the upper and lower sides, and being stuck by pressure as a process of (e). And it is calcinated in order to make the ceramic student sheets 15a-15e which constitute the layered product 11 by which the rear-face electrode 13 was formed in the rear face whose surface electrode 12 is a principal plane on the other hand, and internal electrodes 14a-14d were formed in the front face which is an another side principal plane inside sinter as a process of (f), after plastic film 17 is removed from a layered product 11. Under the present circumstances, a surface electrode 12, the rear-face electrode 13, and internal electrodes 14a-14d are calcinated by the ceramic student sheets 15a-15e and coincidence, and a surface electrode 12 and the rear-face electrode 13 are connected with internal electrodes 14a-14d by beer halls 16a and 16b. Moreover, some of surface electrodes 12 and rear-face electrodes 13 are eating into surface 11a and rear-face 11b of a layered product 11 according to the sticking-by-pressure process. A stacked type ceramic condenser 10 is manufactured through the above production process.

[0023] Since it can prevent plating liquid invading between the rear face of a layered product, and a rear-face electrode at the time of acid treatment, such as plating, since the rear-face electrode is made to eat into the rear face of a layered product according to the stacked type ceramic condenser of this example as mentioned above, it can prevent a rear-face electrode exfoliating from a layered product. Moreover, since the rear-face electrode is eating into the rear face of a layered product also when the force joins the edge of a rear-face electrode, it can prevent a rear-face electrode exfoliating from a layered product.

[0024] Furthermore, according to a sticking-by-pressure process, in order to make resistance small, even if it thickens thickness of a rear-face electrode, in order to form a rear-face electrode in the rear face of a layered product, the smooth nature of a rear-face electrode does not get worse. Therefore, resistance of a rear-face electrode can be lowered at the time of high frequency use, and the property of a stacked type ceramic condenser can be raised at it.

[0025] Moreover, since irregularity of a beer hall is not made at the rear face of a layered product after baking, the rear face of a layered product becomes smooth and a blot of a rear-face electrode is lost. Therefore, since the densification of a rear-face electrode becomes possible, the miniaturization of laminating ceramic electronic parts is attained.

[0026] Furthermore, since it calcinates, while a rear-face electrode can be made according to the manufacture approach of the stacked type ceramic condenser of this example to eat into the rear face of a layered product after sticking by pressure the layered product from which the ceramic student sheet with which the surface electrode or the internal electrode was prepared on the plastic film with which the rear-face electrode was prepared puts, and is obtained and removing plastic film from a layered product, the location of a rear-face electrode and the location of a beer hall can be made in agreement as a design. Therefore, the densification of a rear-face electrode becomes possible and the miniaturization of a stacked type ceramic condenser is attained.

[0027] Moreover, since a rear-face electrode is crushed at the time of sticking by pressure, a rear-face electrode becomes precise and can lower resistance of a rear-face electrode.

[0028] Furthermore, in order to perform to coincidence the process which calcinates a layered product, and the process which can be burned in a rear-face electrode, manufacture becomes possible at the baking process of 1 time. Therefore, reduction of a manufacturing cost and compaction of a production process can be performed.

[0029] In addition, although this example explained the case where a stacked type ceramic condenser was manufactured separately, a stacked type ceramic condenser may be manufactured by accumulating a mother ceramic student sheet, forming a mother layered product, and cutting the mother layered product. In this case, since two or more stacked type ceramic condensers at the process of 1 time can be manufactured, a manufacturing cost can be reduced further.

[0030] Moreover, although the case where the connecting means of a surface electrode, an internal electrode and a rear-

face electrode, and an internal electrode was a beer hall was explained, a through hole, end-face electrodes, and those combination are sufficient.

[0031] Furthermore, after plastic film was removed from the layered product, the case where a layered product was calcinated was explained, but in case a layered product is calcinated, plastic film may be removed by baking.

[0032] Moreover, although some rear-face electrodes explained the case where it was eating into the rear face of a layered product, all the rear-face electrodes may be eating into the rear face of a layered product.

[0033] Furthermore, although the case of a stacked type ceramic condenser was mentioned as the example and explained, it cannot be overemphasized that it is applicable to other laminating ceramic electronic parts, such as a laminating ceramic inductor, a laminating ceramic resistor, or laminating ceramic composite part that swerved and made the plurality of \*\*'s and others component one.

[0034]

[Effect of the Invention] Since it can prevent plating liquid invading between the rear face of a layered product, and a rear-face electrode at the time of acid treatment, such as plating, since the rear-face electrode is made to eat into the rear face of a layered product according to the laminating ceramic electronic parts of claim 1, it can prevent a rear-face electrode exfoliating from a layered product. Moreover, also when the force joins the edge of a rear-face electrode, it can prevent a rear-face electrode exfoliating from a layered product.

[0035] Furthermore, according to a sticking-by-pressure process, in order to make resistance small, even if it thickens thickness of a rear-face electrode, in order to form a rear-face electrode in the rear face of a layered product, the smooth nature of a rear-face electrode does not get worse. Therefore, resistance of a rear-face electrode can be lowered at the time of high frequency use, and the property of a stacked type ceramic condenser can be raised at it.

[0036] Moreover, since irregularity of a beer hall is not made at the rear face of a layered product after baking, the rear face of a layered product becomes smooth and a blot of a rear-face electrode is lost. Therefore, since the densification of a rear-face electrode becomes possible, the miniaturization of laminating ceramic electronic parts is attained.

[0037] Since it calcinates, while a rear-face electrode can be made according to the manufacture approach of the laminating ceramic electronic parts of claim 2 to eat into the rear face of a layered product after sticking by pressure the layered product from which the ceramic student sheet with which the surface electrode or the internal electrode was prepared on the plastic film with which the rear-face electrode was prepared puts, and is obtained and removing plastic film from a layered product, the location of a rear-face electrode and the location of a beer hall can be made in agreement as a design. Therefore, the densification of a rear-face electrode becomes possible and the miniaturization of laminating ceramic electronic parts is attained.

[0038] Moreover, since a rear-face electrode is crushed at the time of sticking by pressure, a rear-face electrode becomes precise and can lower resistance of a rear-face electrode.

[0039] Furthermore, in order to perform to coincidence the process which calcinates a layered product, and the process which can be burned in a rear-face electrode, manufacture becomes possible at the baking process of 1 time. Therefore, reduction of a manufacturing cost and compaction of a production process can be performed.

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[Translation done.]